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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/800,512	03/08/2001	Takanobu Takeda	KOJIM-383	5073

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EXAMINER
LEE, SIN J

ART UNIT	PAPER NUMBER
1752	12

DATE MAILED: 08/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

A 5-12

Office Action Summary	Application No. 09/800,512	Applicant(s) TAKEDA ET AL.	
	Examiner Sin J Lee	Art Unit 1752	

-- The MAILING DATE of this communication appears on the cover sheet with th correspondence address --

Peri d for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-13,15 and 16* is/are rejected.

7)☒ Claim(s) *6 and 14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

1. Claims 1, 2, 4, 5, 7, and 8 are rejected under 35 U.S.C. 102(e) as being anticipated by Choi et al (6,284,438 B1).

In Example 9, Choi teaches a photoresist composition containing a polymer mixture of poly(hydroxystyrene-t-butyl methacrylate) (Mw of 12,500) and poly(*t-butoxycarbonyl*oxystyrene-hydroxystyrene) (Mw of 12,700), triphenyl sulfonium triflate (a photoacid generator), propylene glycol monomethyl ether acetate (an organic solvent), and triethanolamine (a basic compound). The t-butoxycarbonyl group in the poly(*t-butoxycarbonyl*oxystyrene-hydroxystyrene) is taught to be equivalent to a tetrahydropyranyl group by Choi in col.5, lines 9-40 (*"R_4 is a C_1 to C_{10} alkoxy-1-ethyl, tetrahydropyranyl, or t-butoxycarbonyl group"*). Based on Choi's teaching, it is the Examiner's position that one of ordinary skill in the art would immediately envisage replacing the poly(*t-butoxycarbonyl*oxystyrene-hydroxystyrene) in the polymer mixture of Example 9 with poly(*tetrahydropyranyl*oxystyrene-hydroxystyrene). The poly(*tetrahydropyranyl*oxystyrene-hydroxystyrene) meets the present formula (1) since in the present formula (1), r and s can both be zeros, x and m in the first and second repeating units can both be zeros, y and n both can be an integer of 1, R^1 can be hydrogen, R can be a hydroxyl group, and R^3 is a group of the present formula (3) wherein R^{12} is a hydrogen atom and R^{13} and R_{14} taken together forms a ring in which R^{13} and R^{14} together is a straight alkylene group of 4 carbon atoms. The poly(hydroxystyrene-t-butyl methacrylate) meets the present formula (2): The hydroxystyrene unit in the

poly(hydroxystyrene-t-butyl methacrylate) teaches the first repeating unit of the present formula (2) since R^6 can be hydrogen and k can be an integer of 1. The t-butyl methacrylate unit in the poly(hydroxystyrene-t-butyl methacrylate) teaches both of the third and fourth units of the present formula (2) since the t-butyl moiety meets both descriptions for present R^{10} (branched alkyl group of 4 carbon atoms) and present R^{11} (tertiary alkyl group of 4 carbon atoms). Since there is no requirement in present claim language that present third and fourth repeating units have to be two different units, it is the Examiner's position that the t-butyl methacrylate unit in Choi's poly(hydroxystyrene-t-butyl methacrylate) teaches both of the third and fourth units of the present formula (2) (therefore, Choi's poly(hydroxystyrene-t-butyl methacrylate) satisfies present limitation that t and w each are positive number, u and v each are 0 or a positive number, either one of u and v is not equal to 0).

Therefore, Choi teaches the present inventions of claims 1, 2, 4, 5, and 8: With respect to claim 5, present claim language does not require the presence of the third repeating unit of the formula (1) of present claim 1. It only requires that if the third repeating unit is present (i.e., if r is a positive number), then the R^4 is selected from the specified groups in claim 5. Therefore, the prior art still teaches present invention of claim 5.

The poly(hydroxystyrene-t-butyl methacrylate) used in the polymer mixture in Choi's Example 9 meets his chemical formula 3 shown in col.5, lines 30-35, and in the formula, Choi teaches that the ratio of q/q+p is from 0.1 to 0.5. since 0.1 is clearly included as the lower end of the taught range, it is the Examiner's position that one of ordinary skill in the art would immediately envisage the ratio of q/q+p to be 0.1. Since Choi's unit (with R_6 being the t-butyl group) teaches both of the third (the v unit) and fourth (the w unit) units of present formula (2)

(as discussed above), the prior art's teaching (i.e., the ratio of q/q+p being 0.1) satisfies present equations of present claim 7 (present u can be zero). Therefore, Choi teaches present invention of claim 7.

2. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al (6,284,438 B1) in view of Houlihan et al (5,843,624).

Choi is discussed above. Choi does not teach presently claimed dissolution regulator. However, it is well known in the art, as evidenced by Houlihan et al (col.3, lines 58-65, col.5, lines 48-52, lines 64-67, and col.6, lines 1-5) to add a dissolution inhibitor to a resist material containing a polymer already having acid labile groups pendant thereto. When one combines a dissolution inhibitor with a polymer already having acid labile groups pendant thereto (as in Choi's polymer used in his Example 9), the contrast between the portion of the resist material that is exposed to radiation and the unexposed portion is enhanced because the alkali solubility of both the polymer and the dissolution inhibitor is altered by the acid generated by the photoacid generator when the resist material is exposed to radiation and post-exposure baked. Therefore, based on Houlihan's teaching, it would have been obvious to one of ordinary skill in the art to additionally employ a dissolution inhibitor in Choi's resist material in order to enhance the contrast between the exposed and unexposed portions of Choi's resist material as taught by Houlihan et al. Therefore, Choi in view of Houlihan would render obvious present invention of claim 3.

3. Claims 9-13, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al (6,284,438 B1) in view of Houlihan et al (5,843,624).

In Example 9, Choi teaches a photoresist composition containing a polymer mixture of poly(hydroxystyrene-t-butyl methacrylate) (Mw of 12,500) and poly(*t-butoxycarbonyl*oxystyrene-hydroxystyrene) (Mw of 12,700), triphenyl sulfonium triflate (a photoacid generator), propylene glycol monomethyl ether acetate (an organic solvent), and triethanolamine (a basic compound). The t-butoxycarbonyl group in the poly(*t-butoxycarbonyl*oxystyrene-hydroxystyrene) is taught to be equivalent to a tetrahydropyranyl group by Choi in col.5, lines 9-40 (*"R_4 is a C_1 to C_{10} alkoxy-1-ethyl, tetrahydropyranyl, or t-butoxycarbonyl group"*). Based on Choi's teaching, it is the Examiner's position that one of ordinary skill in the art would immediately envisage replacing the poly(*t-butoxycarbonyl*oxystyrene-hydroxystyrene) in the polymer mixture of Example 9 with poly(*tetrahydropyranyl*oxystyrene-hydroxystyrene). The poly(*tetrahydropyranyl*oxystyrene-hydroxystyrene) meets the present formula (1) since in the present formula (1), r and s can both be zeros, x and m in the first and second repeating units can both be zeros, y and n both can be an integer of 1, R^1 can be hydrogen, R can be a hydroxyl group, and R^3 is a group of the present formula (3) wherein R^{12} is a hydrogen atom and R^{13} and R_{14} taken together forms a ring in which R^{13} and R^{14} together is a straight alkylene group of 4 carbon atoms.

Choi's poly(hydroxystyrene-t-butyl methacrylate) does not teach present formula (2) of claim 9 since in the present formula (2), R^{11} can only be represented by present formula (5) or (6) shown in claim 9. The t-butyl moiety in Choi's poly(hydroxystyrene-t-butyl methacrylate) is an acid labile group, and it is well known in the art that t-butyl group and 1-methylcyclohexyl group are equivalent acid labile groups as evidenced by Houlihan et al, col.5, lines 8-9. Because Houlihan et al teach the equivalence of t-butyl group and 1-methylcyclohexyl group as acid

labile groups, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to replace the t-butyl methacrylate unit in Choi's poly(hydroxystyrene-t-butyl methacrylate) with the 1-methylcyclohexyl methacrylate unit so as to make *poly(hydroxystyrene-1-methylcyclohexyl methacrylate)* in Choi's Example 9. Since 1-methylcyclohexyl moiety teaches present formula (5) of claim 9 (since R^{18} can be a methyl group, and b can be an integer of 3), Choi in view of Houlihan would render obvious present inventions of claims 9, 10, 12, 13, 15, and 16: With respect to claim 13, present claim language does not require the presence of the third repeating unit of the formula (1) of present claim 9. It only requires that if the third repeating unit is present (i.e., if r is a positive number), then the R^4 is selected from the specified groups in claim 13. Therefore, the prior art still teaches present invention of claim 13.

With respect to present claim 11, Choi does not teach presently claimed dissolution regulator. However, it is well known in the art, as evidenced by Houlihan et al (col.3, lines 58-65, col.5, lines 48-52, lines 64-67, and col.6, lines 1-5) to add a dissolution inhibitor to a resist material containing a polymer already having acid labile groups pendant thereto. When one combines a dissolution inhibitor with a polymer already having acid labile groups pendant thereto (as in Choi's polymer used in his Example 9), the contrast between the portion of the resist material that is exposed to radiation and the unexposed portion is enhanced because the alkali solubility of both the polymer and the dissolution inhibitor is altered by the acid generated by the photoacid generator when the resist material is exposed to radiation and post-exposure baked. Therefore, based on Houlihan's teaching, it would have been obvious to one of ordinary skill in the art to additionally employ a dissolution inhibitor in Choi's resist material in order to enhance the contrast between the exposed and unexposed portions of Choi's resist material as

taught by Houlihan et al. Therefore, Choi in view of Houlihan would render obvious present invention of claim 11.

Allowable Subject Matter

4. Claims 6 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims since present claims 6 and 14 require the presence of the last repeating unit of present formula (1) and Choi does not teach or suggest such polymer.

Response to Arguments

5. Applicants argue that none of the polymers of Choi teaches the present $-OR^3$ acid labile group wherein R^3 is of the recited formula (3) and also that the combination of Houlihan with Choi does not suggest such acid labile group-containing polymer.

However, *as explained above*, Choi teaches a polymer mixture containing poly(t-butoxycarbonyloxystyrene-hydroxystyrene) in Example 9, and since the prior art teaches the equivalency of the t-butoxycarbonyl group and tetrahydropyranyl group, one of ordinary skill in the art would immediately envisage replacing the poly(t-butoxycarbonyloxystyrene-hydroxystyrene) in the polymer mixture of Example 9 with poly(tetrahydropyranyloxystyrene-hydroxystyrene). The Examiner established above that the tetrahydropyranyl group in the poly(tetrahydropyranyloxystyrene-hydroxystyrene) teaches present R^3 group of the formula (3) since R_{12} can be a hydrogen atom and R_{13} and R_{14} taken together can form a ring in which R_{13}

and R_{14} together is a straight alkylene group of 4 carbon atoms. Therefore, Choi teaches present $-OR^3$ acid labile group.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is (703) 305-0504. The examiner can normally be reached on Monday-Friday from 8:30 am EST to 5:pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ms. Janet Baxter, can be reached on (703) 308-2303. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9311 for after final response or (703) 872-9310 for before final responses.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0661.

S. J. L.
S. Lee
August 1, 2003

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